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(71) Applicant: **BIOLOK International, Inc.**
Deerfield Beach, Florida 33442 (US)

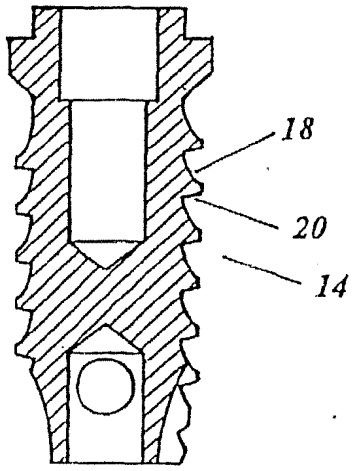
(72) Inventors:
- **Shaw, Leon**
  Deerfield Beach, Florida 33442 (US)
- **Hollander, Bruce**
  Deerfield Beach, Florida 33442 (US)

(74) Representative: **Lorenz, Werner, Dr.-Ing.**
Lorenz & Kollegen,
Fasanenstrasse 7
89522 Heidenheim (DE)

(54) Buttress thread dental implant

(57) A dental implant includes a rigid body having axially symmetric and radially circumferential spiral pitch surfaces, in a range of about 22 to about 28 pitch surfaces per axial inch, an upper concave bevel surface above each pitch surface, which is longer than a lower bevel surface beneath each pitch surface, and an intersection of each plane of each pitch surface, and each plane of each lower bevel surface defining a total included angle in a range of about 90 to about 130 degrees, the rigid body having minor thread diameters at intersections, between pitch surfaces, of the upper and lower bevel surfaces, the pitch surfaces and the minor thread diameters defining, at any axial radius of the rigid body, a ratio of thread pitch to thread depth in a range of about 1.25:1 to about 1.40:1. Each of the lower bevel surfaces define a total included angle in a range of about 20 to about 30 degrees relative to any given axial radius of the implant at a minor thread diameter.

FIG. 3



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DETAILED DESCRIPTION OF THE INVENTION

[0012] Figs. 1A and 1B show a typical prior art screw implants 10 and 10a having a plurality of radially symmetric upper and lower bevel surfaces 12 and 12a. As noted in the Background of the Invention above, such prior art implants will typically have forty pitches (threads) or more to an axial inch of screw length.

[0013] A first embodiment of a dental implant 14 is shown in the elevational view of Fig. 2, the cross sectional view of Fig. 3, the bottom view of Fig. 4 and the enlarged bevel surface view of Fig. 5. As may be noted, the envelope of the implant defines a conical segment. The ratio of the major-to-minor bases 24 and 26 respectively may vary from about 1.5 : 1.0 as much as about 4.0:1.0 (see Fig. 6). Therein, the invention may be seen to comprise a so-called buttress-thread screw-like body having in the range of about twenty-two to about twenty-eight pitch surfaces 16 per inch. A preferred mode of the present invention has been determined to be about twenty-five pitch surfaces per axial inch, that is, .040 inches between threads.

[0014] The invention is further characterized by a particular relationship in geometry of upper bevel surface 18 to lower bevel surface 20. See particularly Fig. 5. As may be noted, the upper bevel surface is substantially longer (by a ratio of more than two to one) than lower bevel surface 20 Also, said upper surface 18 is concavely curved at a radius of about .040 inches, while lower bevel surface 20 is substantially flat. It is noted that in a preferred embodiment the major thread diameter, which corresponds to the location of pitch surface 16 in Fig. 5, is .142 inches and the minor thread diameter 22 is about .112 inches. Accordingly, the difference between major and minor thread diameters, i.e., the thread depth is about .030 inches. Also the ratio of major-to-minor threads diameter is in the range of 1.2:1 to 1.3:1.

[0015] A further defining characteristic of the geometry of the instant dental implant is that of a first bevel angle A (see Fig. 5) which is in the range of about 90 to about 130 degrees, with 110 degrees constituting the preferred embodiment thereof. Another defining aspect of the invention is that of angle B which is a second bevel angle of lower bevel surface 20 relative to a transverse radial cross-section (axial radius) of the implant 14. This angle is in a range of about 20 to about 30 degrees.

[0016] It is also noted that the ratio of thread pitch, that is, the distance between successive pitch surfaces 16 and thread depth (as defined by minor thread diameter 22) is in the range of 1.25:1 to 1.40:1. This relationship differs materially from prior art ratios (see Fig. 1) in which the ratio of thread pitch to thread depth is approximately 1 to 1.

[0017] It has been found that the above combination of pitches per axial length, ratio of lengths of upper-to-lower bevel surfaces, and said total included bevel angle A, produce a resultant dental implant having far superior anatomical compatibility and durability than prior art dental implants. There is, as such, obtained an implant having substantial resistance to micro-mechanical axial, rotational and other movements resultant from forces, stresses and strains which are typically encountered, over time, by the implant.

[0018] It is noted that the axial face of each bevel surface 16 (the major thread diameter) is in a preferred embodiment, flattened and will have a flat axial surface of about .001 inch.

[0019] In Fig. 6 is shown an embodiment of the invention including a rigid body 140 having a high aspect ratio, e.g., 4:1 of upper base 124 to lower base 126, and having a recessed head 122. As such, the upper base is much larger than the lower base.

[0020] In Fig. 7 is shown another embodiment in which a rigid body 240 includes a cylindrical upper portion 28 and a lower integral cylindrical section 30 having a taper of about nine degrees relative to cylindrical envelope 33 and a length of about 6mm relative to a 12 mm length of the upper portion 28.

[0021] In Fig. 8 is shown a further embodiment in which a rigid body 340 includes cylindrical sections 34, 36 and 38 of successively smaller diameter. Such body 340 may have lengths of 8, 10 or 13 mm, and the sections thereof may have axial lengths of 2 to 5 mm.

[0022] It is also noted that a dental implant in accordance with the present invention may be provided with any type of head. Also, the implant may be self-tapping.

[0023] It is yet further noted that an implant of the instant type may be advantageously used as a bone screw in orthopedic applications.

[0024] While there has been shown and described the preferred embodiment of the instant invention it is to be appreciated that the invention may be embodied otherwise than is herein specifically shown and described and that, within said embodiment, certain changes may be made in the form and arrangement of the parts without departing from the underlying ideas or principles of this invention as set forth in the Claims appended herewith.

Claims

1. A bone implant comprising:

a rigid body having thereupon axially symmetric and radially circumferential spiral pitch surfaces, in a range of about 22 to about 28 pitch surfaces per axial inch, an upper concave bevel surface above each pitch surface, which is longer than a lower bevel surface beneath each pitch surface, and an intersection of each plane of each pitch surface and each plane of each lower bevel surface defining a total included angle in a range of about 90 to about 130 degrees, said rigid body having minor thread diameters at intersections, between pitch surfaces, of said upper and lower bevel sur-

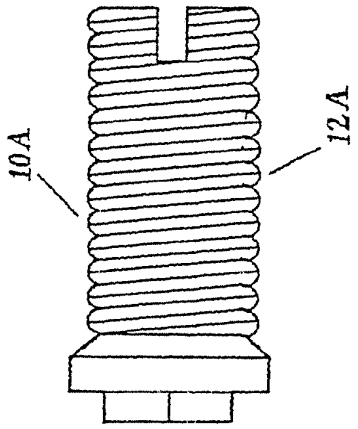

FIG. 1B

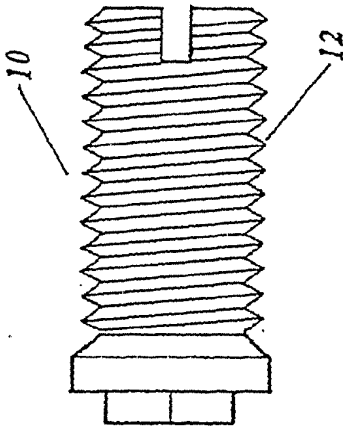

FIG. 1A

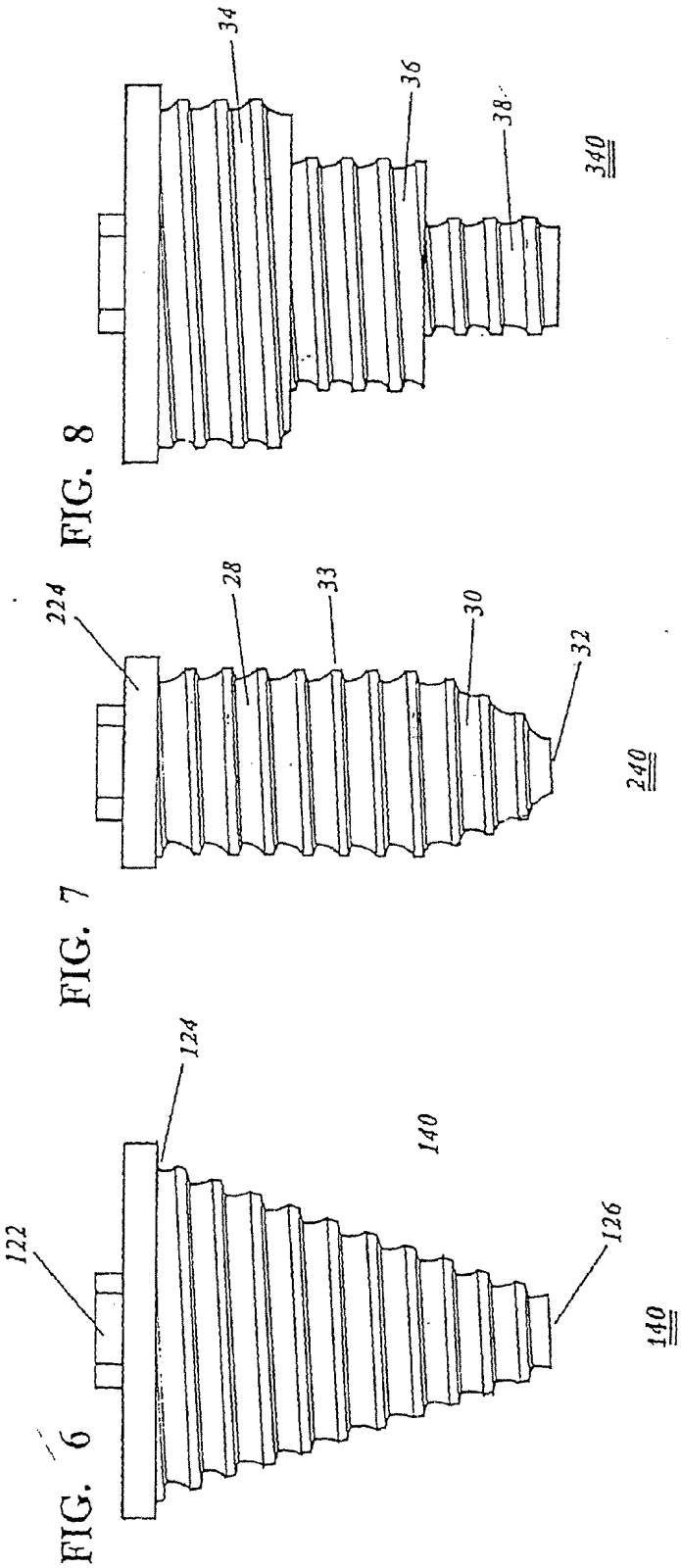

FIG. 6

FIG. 7

FIG. 8

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 00 10 8139

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29-08-2000

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5964766 A	12-10-1999	NONE	
US 4324550 A	13-04-1982	CH 642838 A	15-05-1984
		CA 1142779 A	15-03-1983
		DE 3043336 A	11-06-1981
		GB 2063680 A,B	10-06-1981
FR 2737847 A	21-02-1997	NONE	
US 5199873 A	06-04-1993	AT 105699 T	15-06-1994
		DE 59101624 D	23-06-1994
		DK 438048 T	20-06-1994
		EP 0438048 A	24-07-1991
		ES 2053209 T	16-07-1994
		JP 3064032 B	12-07-2000
		JP 7067888 A	14-03-1995

EPO FORM P0459

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